A DESCRIPTION

OF A

NEW ANEMOMETER,

By RICHARD KIRWAN, Esq. L. L. D. P. R. I. A. F. R. S. &c. &c.

THAT rain, on whose presence or absence at the different seasons of the year, vegetation, and the success of agriculture, in great measure depend, and also the temperature of the atmosphere, to whose influence both animals and vegetables are subject, arise from, or at least are strictly connected with the various directions and velocities of winds, is well known. Nor has it escaped observation, that the primary cause of the direction of the wind from a given quarter, as well as of the velocity of its progress, is the rarefaction of the atmosphere in that tract towards which it blows. The reason why air does not rush in from all sides towards the rarefied tracts, seems to me to be the inequality of its density in the surrounding tracts; for from that quarter, in which the mercury in the barometer stands highest, the air must

must preferably proceed. If the density be equal on all sides, as in some confined tracts, a hurricane happens: hence the advantage of ascertaining and comparing the degrees of its velocity; for those being known, its cause and degrees of rarefaction may with great probability be inferred. Two causes of rarefaction are already known, solar heat, and some internal chemical action, by which a quantity of air is converted into water, and sometimes even into a stony substance; this last being the most sudden and complete, the rarefaction of the neighbouring air arising from it, is by far the most violent, but commonly of a much shorter duration and extent. An accurate measure of the velocity of wind has long been sought by meteorologists: several have been devised on the Continent, but only two, that I know of, in England. That, which I now lay before the Academy, seems to me to be the simplest and best adapted to the purpose. The force of wind, to which the degrees of its velocity are proportional, is measured by that of gravity indicated in pounds and parts of a pound averdupois; the calculation is grounded on the observations of Mr. Smeaton, in the Philosophical Transactions, Vol. LI. p. 165.

2. Mr. Smeaton indeed observes, that the evidence of the velocity is not so great where this exceeds 50 miles, as when 50 or under; yet, from its agreement with other observations, I am inclined to think it fully sufficient.

3. A velocity of 123 feet per second was observed at Petersburgh, an. 1741, 3 Much. 468, that is at the rate of 83,8 miles per hour.

4. According

4. According to Lalande, in his Treatise on Navigation, 42 Roz. Jour. 221. the course of the trade winds is between 6 and 7 miles an hour.

5. Mr. Brice, Philosophical Transactions, 1756, p. 226, observed a storm, whose velocity was 63 miles per hour.

6. A fair wind at sea, is that whose velocity amounts to 20 feet per second, or 13,63 miles per hour. Ibid.

7. Bouguer found the velocity of winter storms to be about 34 miles per hour, and in summer nearly 43. Ibid.

The distance from Holyhead to the Pigeon-house is 70 miles; then supposing the wind to be direct, and its velocity 30 miles per hour, and if we suppose the packet-boat to assume 0,4 of the velocity of the wind, it will arrive at the Pigeon-house in 5,8 hours.

Let W denote the velocity of wind in the open air, or meeting no opposition;

D = the distance of the place towards which the wind tends;

N the number of hours it requires to traverse that distance;

Then any two of these being known, the other may be found by the following formulas.

Given.	Sought.		
W. D.	N.	$N=\frac{D}{W}$	Thus if $W=30$, $D=70$ then $N=\frac{70}{30}=2,33$
W. N.	D.	$D=W\,N$	$D=30\times2,33=70$
D. N.	W.	$W=\frac{D}{N}$	$W=\frac{70}{2,33}=30.$

A well sailing ship assumes $\frac{1}{3}$ of the velocity of the wind.

The best sailing ship 0,4 of the wind's velocity.

The

The above formulas applied to the calculation of a ship's way.

Given.	Sought.	
0,4 W. D.	N.	$N=\frac{D}{0,4\ W}$
0,4 W. N.	D.	$D=0,4\ W\ N.$
D. N.	0,4 W.	$0,4\ W=\frac{D}{N}$

Thus the wind 30, and the distance 70 miles, then the uumber of hours requisite to traverse that distance will be 5,8 for $30\times0,4=12,0$ and $12)70=5,8$ hours.

Again 0,4 W. being 12, and the hours, 5,8, being given, the distance 70 miles, we have $5,8\times12=69,6$. by the second formula.

And, lastly, the number of hours=5,8, and space in miles=70 being given, we have 0,4 of the velocity of the wind$=\frac{70}{5,8}=12$; and dividing this by 0,4, we have the rate per hour of its course in the lower atmosphere.

EXPLANATION OF THE DRAWING.

Fig. 1. The anemometer, with a vane or weather cock placed on the top, to shew the direction of the lighter winds, which could not be known by the anemometer, on account of the weight of the necessary appendages annexed to it. This is raised of a sufficient height

height above the building, supported by a vertical axis or pole; the lower end of it passes through the roof and ceiling into an apartment below.

Fig. 2. The lower part of the pole or vertical axis AA. Fig. 1. more enlarged, to give a better view of the necessary appendages. This pole is made of a slender spar, such as are made use of for strong setting poles for lighters, and handles for boat-hooks, as not being affected by lightning, which iron too often is, and the cause of the destruction of buildings and many lives. To this pole is fastened a frame of light wood by screws, in which the weights are confined, one on the top of another, in grooves, in such a manner as to work up and down with the greatest facility. The weights are connected together by cords, and marked 1. 2. 3. 4. &c.; the space between each, when drawn up by the force of the wind, is about one inch, as may be seen by the drawing, and each weighs one pound averdupois. To the top weight is fastened a line, and passing along the pole to the top, and over a brass pully fixed at the bottom of the square tube, under the sliding rod B. Fig. 3. as far as (*a*), and there fastened: in this sliding rod a groove or channel is cut underneath, to receive the line, so as not to impede its passage over the brass rollers *ff*. The line is composed of a number of common sewing threads, laid in different directions, well waxed, and inclosed in a cotton case, to prevent

 K as

as much as possible its extension or contraction by the changes of the atmosphere.

Fig. 3. The wooden pipe or tube two inches square, fastened on the top of the pole AA. Fig. 1. open on the side, to shew the manner that the sliding rod B passes over the brass rollers *fff*, when the wind is sufficiently strong to lift up one pound by its force on the square surface presented to it, as (*b*) and (*c*), Fig. 4.

4. The wooden pipe or tube, in which are inclosed the sliding rod, rollers, and line, from the effects of the weather.

5. The wooden frame, made of light wood, one foot square, covered over with very thin sheet brass, strongly painted, and varnished with copal. This frame is fastened to the sliding rod B. Fig. 3. by means of a mortice, &c.

6. An enlarged view of the scale and index, which marks the greatest force of the wind during the absence of the observer, which is attached to the frame confining the weights, as GH. Fig. 2.; and being connected with the hand fastened on the top weight (*d*. Fig. 2.) raises the small weight (*e*); and this being counterpoised by another of equal weight, by means of a line passing over a small pully, as represented by this Fig. and also G. Fig. 2. occasions the small weight, with its index, to stop at the number of pounds raised by the force of the wind, though they should

fall

fall down into their proper places on the wind's abating.

The bottom of the vertical axis or pole F. Fig. 2. is sheathed with a steel point, and a socket, which rest on a wooden stand or frame, as at D. Fig. 1. so as to turn with ease, and avoid as much as possible any friction.

I have also to remark, that in order to render this simple machine more complete, and answer the purpose of an Anemoscope, as well as an Anemometer, it is only necessary to apply to that part of the pole or axis, which is in the apartment, an index, and attach to the ceiling a thin deal board, or a sheet of pasteboard, with the points of the compass marked thereon.

A Table shewing the Velocity of the Wind in Miles per Hour, indicated by Avoirdupois Pounds and Parts.

Miles per hour.	Pounds and Parts.	DENOMINATIONS.	Miles per hour.	Pounds and Parts.	DENOMINATIONS.	Miles per hour.	Pounds and Parts.	DENOMINATIONS.
10	0,492		32	5,067		53	13,923	
11	0,615		33	5,386	Storm.	54	14,464	
12	0,738	Pleasant wind.	34	5,705		55	15,007	
13	0,861		35	6,025		56	15,548	
14	0,984		36	6,394	Great storm.	57	16,089	
15	1,107		37	6,763		58	16,630	
16	1,279		38	7,132		59	17,171	
17	1,451	Brisk gale.	39	7,501	Very great storm	60	17,715	
18	1,623		40	7,873		61	18,403	
19	1,795		41	8,291	Violent tempest.	62	19,091	
20	1,968		42	8,709		63	19,779	
21	2,169		43	9,127		64	20,467	
22	2,370		44	9,545	Hurricane.	65	21,158	
23	2,571	Very brisk gale.	45	9,963		66	21,846	
24	2,772		46	10,430		67	22,534	
25	2,975		47	10,897		68	23,222	
26	3,265		48	11,364		69	23,910	
27	3,555	High wind.	49	11,831		70	24,602	
28	3,845		50	12,300				
29	4,135		51	12,841				
30	4,429	Very high wind.	52	13,382				
31	4,748							

Fig. 1.

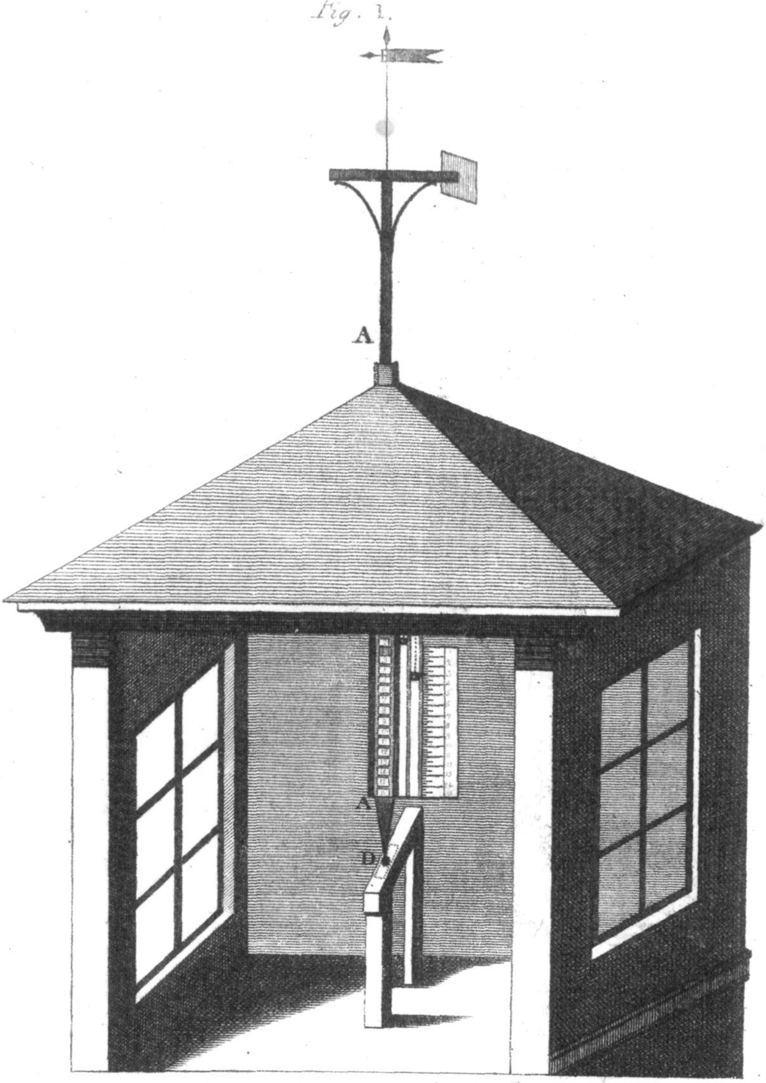


Fig.

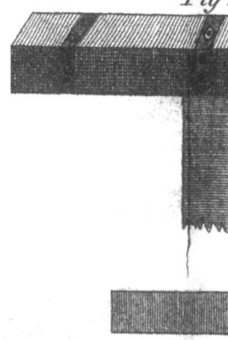


Fig. 5

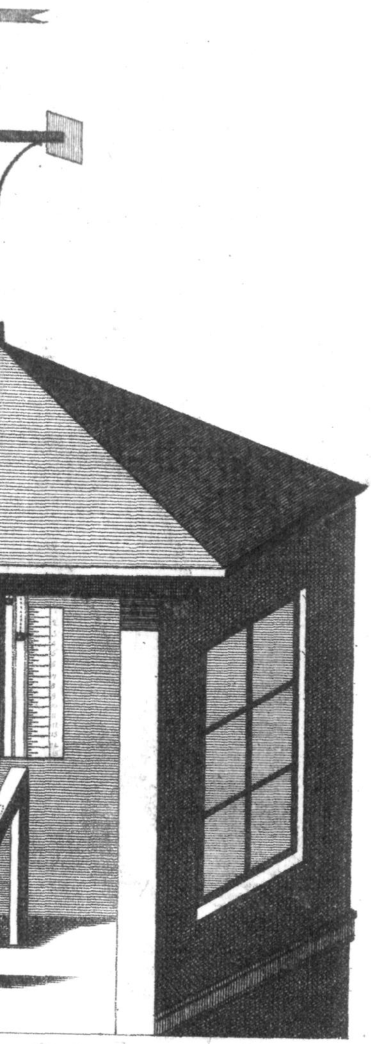


Fig. 4.

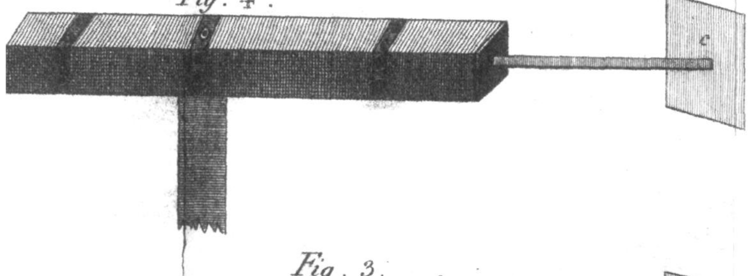


Fig. 3.

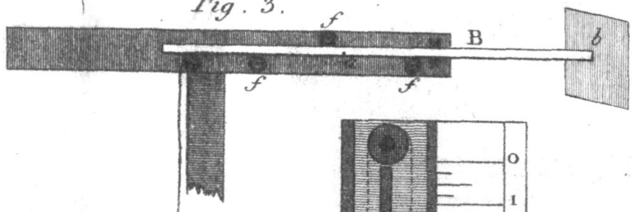


Fig. 5.

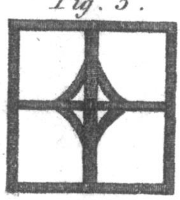
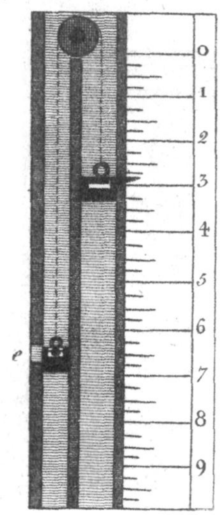


Fig. 6.



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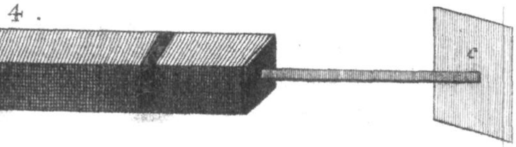

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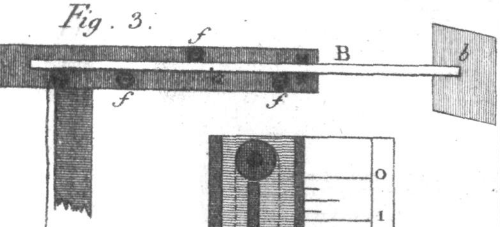

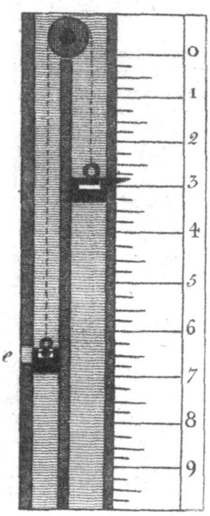

Fig. 6.

Fig. 2.